

§19. Radial K_{α} Profile of High Z Element
Obtained with Pulse Height Analyzer in
LHD

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For the spectroscopic studies of high temperature plasmas, spatial resolution is as important as time resolution. Spatial- and time-resolved spectroscopy in the x-ray region is required to obtain significant information about electron temperature profile as well as impurity transport. In this report the first experimental result of time resolved Ar profiles in LHD is presented.

An assembly of Pulse Height Analyzers (PHA) has been designed and constructed to investigate the profiles of the x-ray spectrum in LHD. The assembly is equipped with a spatially scanning system which makes it possible to estimate the radial profile of x-ray spectrum. The scanning system basically consists of a diaphragm which is flipped by a linear-motion mechanism. With this system, the sight line of the PHA can be scanned in the radial direction of LHD. The most specific feature of the assembly is that inversion of a line integrated spectrum to a radial profile is possible. The range of x-rays measured by the assembly is from 1 to 13 keV. In this region, both continuous radiation as well as and the K_{α} lines emitted from Ar have been observed.

In the present research a radial profile of the x-ray spectrum has been successfully obtained with a spatial resolution of a few centimeters [1]. Especially, the radial profile of Ar has been estimated with a time resolution of 25 msec.

Fig.1 shows a line integrated profile of Ar. In this experiment, several identical discharges were performed, while the position of the sight line was changed shot by shot. From the figure it is qualitatively suggested that the brightness of the Ar line in the outer region is much larger than in the plasma center.

The intensity of Ar line follows the Ar puff as shown in Fig.2. The intensity increases and decays within approximately 500 msec after the puff, while the profile remains approximately constant. The time resolved profile reflects the diffusion coefficient and convective velocity of Ar. A quantitative analysis of the transport is in progress.

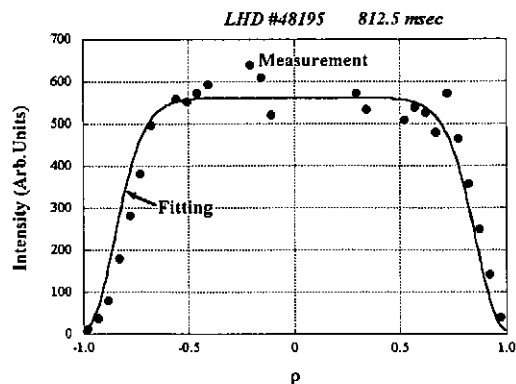


Fig.1. The line integrated profiles of Ar K_{α} . The points and solid line represent the experimental data and a fitting function, respectively. The function used for the fitting line is $e^{-(\rho/\sigma)^{10}}$, where the symbols denote the averaged minor radius and width, respectively.

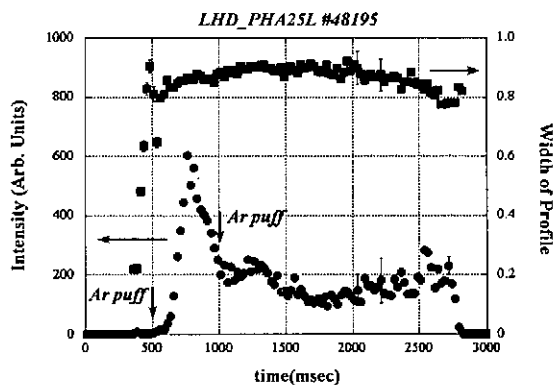


Fig.2. The time evolution of Ar K_{α} (filled circle) and the width of the profile (filled square). The intensity has increased twice after each two Ar puff (two perpendicular arrows).

Reference

[1] Muto S., and Morita S., Rev.Sci.Instrum. 72,1(2001)1206.